The Great Unknowns

Brief Overview:

When students experience balanced equations they gain basic concepts of mathematical ideas as well as use problem solving skills needed in life. Students need to be able to apply an appropriate method of computation that demonstrates their understanding of mathematical theories. The activities included in this unit engage students in writing equations, recognizing patterns in function tables, and solving word problems. Differentiation for each activity is provided.

NCTM Content Standard/National Science Education Standard:

1. **Understand patterns, relations, and functions.**
    - **Represent and analyze patterns and functions, using words, tables, and graphs.**
2. **Represent and analyze mathematical situations and structure using algebraic symbols.**
    - **Represent the idea of a variable as an unknown quantity using a letter or a symbol.**
    - **Express mathematical relationships using equations.**
3. **Use Mathematical models to represent and understand quantitative relationships.**
    - **Model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.**
4. **Build new mathematical knowledge through problem solving.**
5. **Solve problems that arise in mathematics and in other contexts.**
6. **Apply and adapt a variety of appropriate strategies to solve problems.**
7. **Monitor and reflect on the process of mathematical problem solving.**
8. **Communicate mathematical thinking coherently and clearly to peers, teachers, and others.**

9. **Use the language of mathematics to express mathematical ideas precisely.**

Enduring Understandings:

Algebraic representations (patterns, functions, expressions, equations, and inequalities) are used in a variety of ways to help us predict and solve problems.

Essential Questions:

- **How are patterns used to make predictions and solve real world problems?**
- **How is skip counting used to solve real world problems?**
- **How are increasing and decreasing patterns different?**
- **How is a function table like a pattern?**
- **How are rules used to complete a function table?**

Grade/Level:

Grades 2-3

Duration/Length:

4 class periods—50-60 minutes each

Student Outcomes:

Students will:

- **Use the inverse relationship between addition and subtraction to write related sentences, solve problems with missing numbers, and verify solutions.**
- **Complete and extend a function table.**
- **Evaluate and justify the unknown in an equation using one operation.**
- **Create equations to represent relationships in real world problems.**

Materials and Resources:

Lesson 1

- **Make copy for each student of Student Resource 1 *Balancing Act***
- **Teacher Resource 1 *Balancing Act***
- **Balance for each pair of students.**
- **Bag of linking cubes or unifix cubes (about 50 per group)**
- **Math Journal**
- **4 construction paper Xs and one equal sign—VERY LARGE**
- **Large number cards 1-9 (4 sets)**
- **Skewers/12 inch dowels**
- **String**
- **Hole punch**
- **2 inch squares—different colors—enough so each student has 15**

Lesson 2

- **Anno's Math Games II by Anno Mitsumasa. New York: Putnam & Grosset, 1997.**
- **Teacher Resource 2 Magic Machine-overheads**
- **Teacher Resource 3 Function Table Patterns**
- **Teacher Resource 4 Function Junction**
- **Student Resource 2 Function Table Patterns**
- **Student Resource 3 Function Junction**
- **Student Resource 4 In/Out Function Table**
- **Student Resource 5 Blank Function Table**
- **Sheet/table cloth**
- **Index cards**
- **Chart paper or chalkboard**

Lesson 3

- **<u>12 Ways to Get to 11</u> by Eve Merriam. New York: Simon & Schuster Books, 1993.**
- **Teacher Resource 5 Be a Detective- overhead**
- **Teacher Resource 6 It's All Unknown at this Point**
- **Teacher Resource 7 They Just Don't Know**
- **Teacher Resource 8 BCR**
- **Student Resource 6 It's All Unknown at this Point**
- **Student Resource 7 They Just Don't Know**
- **Student Resource 8 BCR**
- **Math Journal**
- **24 Game (card game or online)**
- **cubes**

Assessment

- **Optional materials: balance and cubes**
- **Student Resource 9 Unit assessment**
- **Teacher Resource 9 Unit assessment-answer key**

Development/Procedures:

Lesson 1 ***Balancing Act***

Pre-assessment

- **Explain in a math journal how the variable X represents the same number in both of these equations. 8 + 4 = X and X = 3 + 9. Justify and support journal explanations with the class.**

Launch

- **Discuss equations: they must be the same amount on both sides.**
- **Demonstrate using students, large number cards, 4 large Xs and large equal sign.**
- **For example: 3 + 4 = X + 2**

- **Elicit responses from students: What do we need X to be in order for the equation to be balanced? We can add 3 + 4 to figure out that the left side of the equal sign is 7. That means that the right side needs to equal the same amount. So what plus 2 equals 7?**
- **Lead students to X being equal to 5.**
- **Try these other examples: 9 + 6 + 2 = 4 + 5 + X**
  2 + 2 + X = 7 + 3
- **Introduce the idea that you can have more than one X in an equation.**
- **Use problem solving skill Guess and Check in order to figure out what number X represents.**
- **For example: X + X + 5 = X + 7**
- **Elicit responses from students. Remind them that X needs to be the same number throughout the problem.**
- **Try student responses. Model by plugging in the numbers.**
- **When the sides are not equal explain that this answer was not correct so we need to try again.**
- **Discuss how guessing and checking can be time consuming. Using a balance would speed up this process.**

Teacher Facilitation

- **Ask students what they know about a balance scale. (Both sides have the same weight or they will not be balanced.)**
- **Re-demonstrate the first problem using the balance and the linking cubes/ unifix cubes. (3 + 4 = X + 2)**
- **How many cubes are needed to make the equation balanced?**
- **Retry the other examples from above:**
  9 + 6 + 2 = 4 + 5 + X
  2 + 2 + X = 7 + 3
- **Put the students into groups of 4. Two students will use the problem solving skill Guess and Check on pencil and paper. The other two students will use the balance and cubes in order to solve the equations below.**
  1) X + X + 5 + X = X + 9
  5 + X + X + X = 9 + X and (X + X + X) + 5 = X + 9
  (Answer: X = 2 Check 11 = 11)

2) 4 + 3 + X + X = X + 5 + 2 + 4
X + X + 4 + 3 = (5 + 2 + 4) + X and (X + X) + 7 = 11 + X
(Answer: X = 4 Check 15 = 15)

- **As a class work through the first 2 problems on Balancing Act Student Resource 1.**
- **Informally assess students' use of strategies.**

Student Application

- **Students work with a partner to finish *Balancing Act* Student Resource 1. Answer key is found on Teacher Resource 1.**
- **Check answers with the class by allowing student volunteers to model and explain which strategy they chose and how they solved the problem.**

Embedded Assessment

- **Students will be creating a balanced equation mobile. They will need the following:**
  1. **Skewer/dowel**
  2. **several long pieces of string**
  3. **15 2-inch squares**
  4. **access to a hole punch**
  5. **scratch paper**
- **Students construct balanced equations on the scratch paper.**
- **They incorporate at least one X and 5 total digits in their equation.**
- **Write the digits used on the squares.**
- **Using the string, suspend the digit squares from the skewer showing equal sides.**
- **Invite students to judge and test their equation mobiles with a partner. Have partners clarify misunderstandings for each other if necessary but remind them not to make the corrections for their partner.**

- **Allow students time to fix their own mistakes.**
- **Collect mobiles.**
- **Use the mobiles in order to create a bulletin board.**

Reteaching/Extension

- **Reteaching: Pull small group if needed to reinforce the concept and how to manipulate the pieces using the balance.**
- **Extension: Students create more complex equations for partners to solve.**

Lesson 2 ***Function Junction***

Pre-assessment

- **Display the simple function table below.**
- **Define function as a non-sequential pattern.**

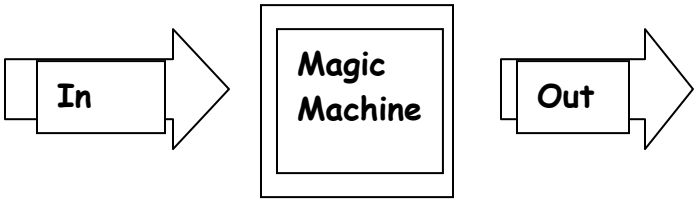
In	**2**	**5**	**12**	**20**	**91**
Out	**4**	**7**	**14**	**22**	**93**

- **Elicit student responses. What is happening to the number? (It's getting bigger)**
- **How do we make a number get bigger? (add or multiply)**
- **How much larger? What pattern do you see?**
- **Does each example follow that rule?**
- **How will the number 35 change according to the rule? (It will grow to 37)**
- **Elicit student examples.**
- **Informally assess students' use of strategies.**

Launch

- **Read <u>Anno's Math Games II</u>. (the first section only)**
- **A wide range of mathematics topics is illustrated through diagrams. The section on the Magic Machine deals with ideas connected to a function machine. The section on Counting with Circles provides a nice introduction to ideas connected with variables.**

- **Set up the Magic Machine in the classroom. Place a sheet over a table. Put a student/volunteer under the table. The student/volunteer has the rule. Give the Magic Machine a number on one side and they write the answer and give it back out of the other side. The class has to figure out the rule based on what the Magic Machine spits out.**



- **Read the pages in the section on The Magic Machine. Have children identify what each machine does. Explain to students that they will have the chance to solve problems using a "function" machine.**

Teacher Facilitation

- **Using *Magic Machine* overheads, see (Teacher Resources 2a-c) the class will analyze the function table and predict a possible rule. Answer keys follow on Teacher Resources 2b-d.**
- **Students must justify their predictions and test all the levels in the table.**
- **Review with students inverse operations and how they work to solve a problem backwards.**

Student Application

- **Students will work in partners to complete *Function Table Patterns* see Student Resource 2. Answer key can be found on Teacher Resource 3.**
- **Students will compare their answers with another pair. Tell students to justify their responses. Be prepared to convince their partners with an additional example that fits the rule.**

- **Circulate and observe student interactions and decision-making. Redirect students if needed.**

Embedded Assessment

- **Students complete *Function Junction* independently (Student Resource 3). Answers are found on Teacher Resource 4.**
- **Discuss strategies used to solve the problems. How did they use inverse operations to find the In when given the Out?**

Reteaching/Extension

- **Reteaching: In small group practice creating a pattern according to a rule and In/Out function table (Student Resource 4).**
- **Extension: Students will create their own function table using *Blank Function Tables* (Student Resource 5).**

Lesson 3 ***It's All Unknown At This Point***

Pre-assessment

- **Discuss with students that a letter or a shape can represent the unknown number.**
- **Remind students that each shape, just like a letter or variable, stands for the same number every time it is used.**
- **Display overhead of *Be a Detective* (Teacher Resource 5) and have students work independently to answer the questions in their Math Journal. Provide cubes for the students to use as they work in their journals. Answer key can be found on Teacher Resource 5b.**
- **Informally assess students' use of strategies.**

Launch

- **Read 12 Ways to Get to 11 by Eve Merriam New York: Simon & Schuster Books, 1993. This book explores number**

sentences as it investigates many different ways to reach the number 11.

- **Instruct students to pick a number. Have them write as many different number sentences as possible. Encourage students to use more than two numbers, addition and subtraction.**
- **Explain to students that today they are going to write number sentences to help them solve some problems.**

Teacher Facilitation

- **Distribute Student Resource 6 to the students.**
- **Model writing number sentences for word problems using *It's All Unknown at this Point* (Student Resource 6). Answer key can be found on Teacher Resource 6.**
- **Underline important words and numbers in the word problem that give you clues as to which operation and what numbers to use.**
- **Model the equation using the variable P for the unknown.**

Student Application

- **Independently complete *They Just Don't Know* (Student Resources 7a-d).**
- **Students will work with a partner on questions 3 and 6 after the page is complete. Answer key can be found on Teacher Resources 7a-b.**

Embedded Assessment

- **Students complete BCR independently (Student Resource 8). Answer key can be found on Teacher Resource 8.**

Reteaching/Extension

- **Reteaching: In small groups, students use cubes and paper to create physical and written representations of equations.**
- **Extension: In small teams, the students can play the "24 Game."(See Appendix C for game information.)**

Summative Assessment

The students will demonstrate their understanding of the concepts involved in creating and solving equations. Unit Assessment (Student Resources 9a-c) should be completed independently. The students will use their problems solving skills as well as their knowledge of balanced equations in order to successfully complete the assessment.
Answer key can be found on Teacher Resources 9a-c.

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Teacher Resource 1

Balancing Act KEY KEY KEY KEY KEY

	Equation	X =	Check
1.	X + 2 = 6 + 4	8	10 = 10
2.	X + X + 3 = 2 + 5	2	7 = 7
3.	X + 8 = X + X + X	4	12 = 12
4.	X + X + X = X + 10 + 2	6	18 = 18
5.	X + X + 2 = 7 + 7	6	14 = 14
6.	X + X + 4 = X + 10	6	16 = 16
7.	X + 8 = 10 + 4	6	14 = 14
8.	X + 2 = 4 + 5	7	9 = 9

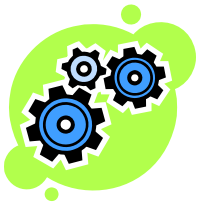
9.What was the purpose of checking your work?

_The purpose of checking my work was to make sure that my answer was correct. I made sure that my equation was balanced and that the X stood for the same number each time I used it.

10. Explain how knowing your fact families helped you to solve these. ***For number 1, 4 + 6 = 10 and 8 + 2 also = 10. Since both sides of the equal sign have to be the same, 2 plus X has to equal 10. So X must be 8.***

Anno's Magic Machine

This is Anno's magic number machine. You put in one number and another number comes out.



You enter:

One number	This comes out
8	16
10	20
11	
21	

a. **What will the machine show if you. . .**

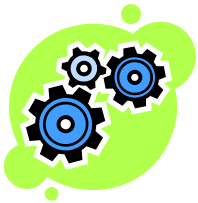
Put in 6? _____

Put in 43? _____

b. **What is the rule the machine is using? _____**

KEY KEY KEY KEY KEY

This is Anno's magic number machine. You put in one number and another number comes out.

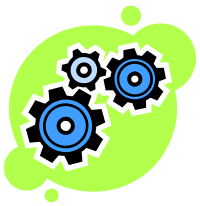


You enter:

One number	This comes out
8	16
10	20
11	22
21	42

A. What will the machine show if you. . .
   Put in 6? _____12_____
   Put in 43? ____86_____
b. What is the rule the machine is using? _____2n or double_____

Here is another magic number machine. You put in one number and another number comes out.



You enter:

One number	This comes out
8	17
10	21
11	
21	

a. What will the machine show if you. .

.

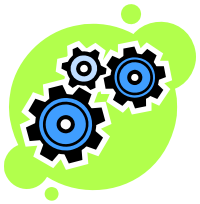
Put in 6? _____

Put in 43? _____

b. What is the rule the machine is using? _____

KEY KEY KEY KEY KEY

Here is another magic number machine. You put in one number and another number comes out.



You enter:

One number	This comes out
8	17
10	21
11	23
21	43

a. What will the machine show if you. .

.

Put in 6? _____13_____

Put in 43? ____87_____

b. What is the rule the machine is using? _____2n + 1 or double + 1_____

Teacher Resource 3

Function Table Patterns Key Key Key Key Key

1.The Anne Arundel Bank's motto is "Watch your money grow." The bank has been helping customers increase their money for years. Katie deposited $6. The bank gave her interest and she now has $9. Jim deposited $8. With the interest the bank gave him, he now has $11. Susan deposited $10. With the interest from the bank, Susan has $13. What is the rule for giving interest? Just now Chuck deposited $13. How much money will he receive from the bank?

Money Deposited	6	8	10	13
Money with Interest	9	11	13	16

Rule: __+ 3_____

2. In Atlantic City everyone was losing money in the slot machines. Peggy put in $35 and received only $25 back. Jim put in $18 and received only $8 back. Dawn put in $22 and received only $12 back. What's going on with the slot machines? Dennis put in $10. What do you think he will get back?

Money Placed in the slot machines	35	18	22	10
Money back from the machines	25	8	12	0

Rule: ___-10_____

Teacher Resource 4

Name: _____

Function Junction- KEY KEY KEY KEY

Complete the function tables. If necessary, find the rule for the table.

Rule: +21

In	24	45	50	65	78	154
Out	**45**	**66**	**71**	**86**	**99**	**175**

Rule: - 20

In	180	100	220	390	570	710
Out	**160**	**80**	**200**	**370**	**550**	**690**

Rule: ??

In	45	92	188	257	63	348
Out	**25**	**72**	**168**	**237**	**43**	**328**

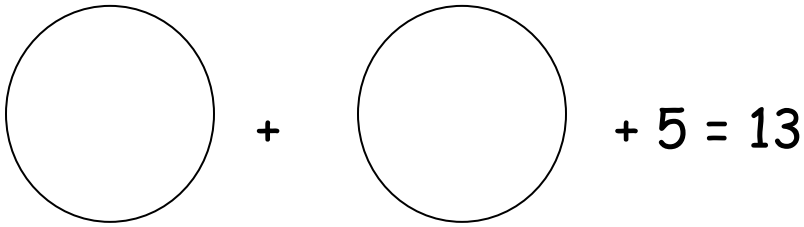
Rule:?? -15

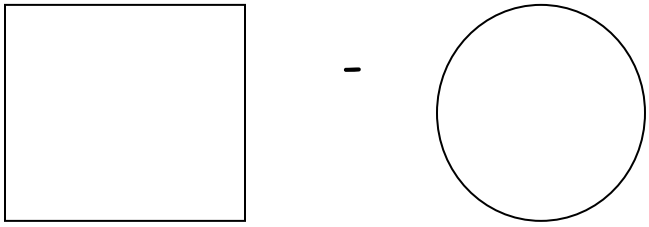
In	80	45	75	90	115	220
Out	**65**	**30**	**60**	**75**	**100**	**205**

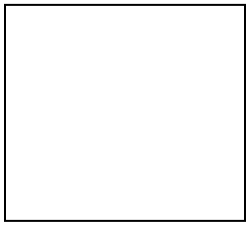
Rule: Double

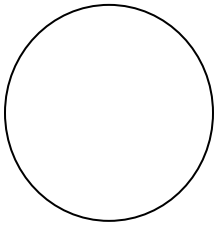
In	5	6	3	2	10	30
Out	**10**	**12**	**6**	**4**	**20**	**60**

Be a Detective!

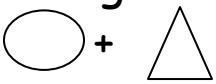


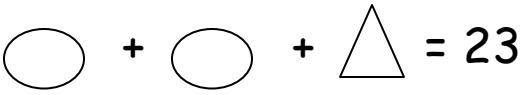


What number is 

What number is 

How did you figure out the numbers?

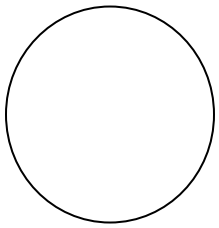
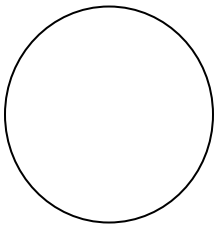
Challenge: 

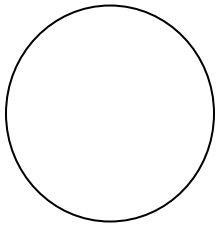


Appendix A Teacher Resources

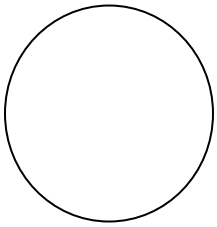
Teacher Resource 5b

Be a Detective! Key Key Key Key

 +  + 5 = 13

 -  = 3

What number is  7

What number is  4

How did you figure out the numbers?

Challenge:  +  = 14 Circle = 9

Triangle = 5

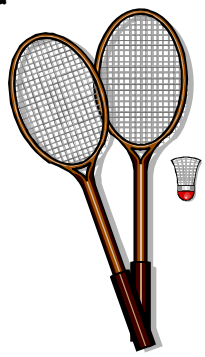
 +  +  = 23

Teacher Resource 6

It's All Unknown At This Point! KEY KEY KEY KEY

Directions: **Read the following word problems and write a number sentence for each one. Then solve them. Show your work.**

1. Gianna was getting ready to have a birthday party at the park and wanted to buy some games for her guests to play. Her mother drove her to Sports Authority and gave her $40 cash. She bought a Funnel Ball set for $4, a soccer ball for $8, a badminton set for $6, and a net for $14.



Games	Cost
Funnel Ball	$4
Soccer Ball	$8
Badminton	$6
Net	$14

a. **Write a number sentence for how much Gianna spent. (Hint: Include a variable in your number sentence.)** **$4 + $8 + $6 + $14 = X**

b. **How much money did Gianna spend at Sports Authority?**

$32

Solve:
$4 + $8 + $6 + $14 = X

c. **Write a number sentence to show how much change Gianna will get back?**

_____$40 - $32 =
$8_____

Solve:

d. **Gianna was only given $20. Which items could she have purchased? Write a number sentence as proof.**

Funnel Ball set for $4+ a soccer ball for $8= $12 or a Funnel Ball set for $4 + a soccer ball for $8 + a badminton set for $6 = $18.00
Or a badminton set for $6 + a soccer ball for $8 = $14 or a Funnel Ball set for $4 + a badminton set for $6 = $10

Teacher Resource 6

1. Chelsea went shopping for ingredients to make brownies. The brownie mix cost $3, the oil was $3, and the eggs had no price on them. The items went through the store register and the total she owed was $9.

a. Write the number sentence below to show the problem. (Hint: Include a variable in your number sentence.)

$3 + $3 + X = $9

b. How much did the eggs cost?

$3

Solve:
3+ 3= 6
9- 6 = 3

c. How much change did she get back from her $20 bill?

$20 – 9= X X = $11

Solve:
$20 – 9 = 11

Teacher Resource 7a

They Just Don't Know! Key Key Key Key

Use the Table to answer the questions. Be sure to include an equation.

School	Number of Classes
Crofton Elm	43
Deale Elm	21
Central Elm	33
Pershing Hill Elm	18
Ridgeway Elm	26

1. Two schools are going to the Baltimore Aquarium on Friday. There are 59 classes in all. We know that Central Elm is one of the schools. What other school is going?

Equation: _____X + 33 = 59

Answer:_____26 Ridgeway _____

2. Next week three schools are going to Arlington Echo for a field trip. The camp director remembers that there are 82 classes coming, but he can't remember the names of all three schools. He knows that Deale and Crofton are two of the schools. Which one is he forgetting?

Equation: _____X + 21 + 43 = 82_____

Answer:_____18 Pershing Hill_____

3. Use the table above to write your own word problem with a missing number. Trade with a partner. Be sure to write your solution on a separate sheet of paper.

Answers may vary.

Animals	Weight in pounds
Giraffe	573
Panda	276
Lion	200
Baby Elephant	954
Kangaroo	342

4. The National Zoo is going to relocate some of their animals. The trucks can only carry so many pounds. The first truck can only hold 500 pounds. Which two animals can ride in that truck?

Equation: _____200 + 276 = 476_____

Answer:_____Lion and Panda_____

5. The second truck can carry 1,191 pounds. The zookeeper knows that the giraffe and the kangaroo are already on that truck. What other animal can ride with them?

Equation: _____573 + 342 + X = 1,191_____

Answer:_____276 Panda_____

6. Use the table above to write your own word problem with a missing number. Trade with a partner. Be sure to write your solution on a separate sheet of paper.

Answers may vary.

BCR

Mrs. Kauffman bought soccer shoes and shin guards. The soccer shoes cost $11. She spent a total of $18 on the soccer gear. How much did the shin guards cost? Write an equation to solve the problem.

Step A:

11 + X = 18 or 18 – X = 11

Step B: Use what you know about equations and problem solving to explain why your answer is correct. Be sure to use words, symbols and/or numbers in your explanation.

I know that my number sentence is $11 + X = $18 because she spent a total of $18 and you only know $11. So, $11 + $7 = $18 and to prove it, use the inverse and find $18 - $11 = $7.

Teacher Resource 9

Name _____ ..... Date _____

Unit Assessment KEY KEY KEY KEY KEY

1. Solve 3 +5 + 6 = 6 +3 + __5__

2. 7 + X = 13 X = 6

   Write the equation that proves this.

   13 – 7 = X 13- 7 = 6

3. Using the table below decide which number is missing and what rule is being used in the table.

In	10	5	8	20	7
Out	15	? 10	13	25	12

Rule: _____X + 5 or plus 5_____

Explain how you figured out the rule and the missing number. *The number going in is getting bigger and so the rule must be + a number. I used the inverse to find 15-10 = 5 and 13 -8 = 5 and 25- 20 = 5, so the missing number must be 10 because 10 – 5 = 5. So, if I subtracted, the rule must be + 5 because 10 + 5 = 15 and 7 + 5 = 12.*

4. Sally bought 10 pounds of birdseed. The birds ate 4 pounds in 1 week. How much was left? Write a number sentence to show how you would solve this. Use the letter X for the unknown.

10 – 4 = X X = 6

5. Maryann was very happy with the order that came from Oriental Trading. She paid for 7 basketballs and received 11. She ordered 5 footballs and received 9. She ordered 9 baseballs and received 13. She was wondering what happened to her order? How many soccer balls do you think she received when she only ordered 3?

Toys ordered	7	5	9	3
Toys received	11	9	13	7

Rule: + 4

6. The goody machine in the airport was having difficulty understanding what people wanted. When they put in a number for a snack, the customers received something entirely different. Mike pressed number 10 and received number 4. Allison pressed number 13 and received number 7. Matt pressed number 17 and received number 11. What rule was the machine using that gave the people the wrong snack? What is going to happen when Marci presses number 20?

Snack number ordered	10	13	17	20
Number of snack received	4	7	11	14

Rule: ___- 6_____

Student Resource 1

Balancing Act

Solve the algebraic equations below. Use the balance and cubes to solve them.

	Equation	X =	Check
1.	X + 2 = 6 + 4		
2.	X + X + 3 = 2 + 5		
3.	X + 8 = X + X + X		
4.	X + X + X = X + 10 + 2		
5.	X + X + 2 = 7 + 7		
6.	X + X + 4 = X + 10		
7.	X + 8 = 10 + 4		
8.	X + 2 = 4 + 5		

9. What was the purpose of checking your work?

_____

_____

10. Explain how knowing your fact families helped you to solve these.

_____

_____

Student Resource 2

Function Table Patterns

1.The Anne Arundel Bank's motto is "Watch your money grow." The bank has been helping customers increase their money for years. Katie deposited $6. The bank gave her interest and she now has $9. Jim deposited $8. With the interest the bank gave him, he now has $11. Susan deposited $10. With the interest from the bank, Susan has $13. What is the rule for giving interest? Just now Chuck deposited $13. How much money will he receive from the bank?

Money Deposited				
Money with Interest				

Rule: _____

2. In Atlantic City everyone was losing money in the slot machines. Peggy put in $35 and received only $25 back. Jim put in $18 and received only $8 back. Dawn put in $22 and received only $12 back. What's going on with the slot machines? Dennis put in $10. What do you think he will get back?

Money Placed in the slot machines				
Money back from the machines				

Rule: _____

Student Resource 3

Name: _____

Function Junction

Complete the function tables. If necessary, find the rule for the table.

Rule: +21

In	24	45	50			154
Out				**86**	**99**	

Rule: - 20

In	180	100	220	390		710
Out					**550**	

Rule: ??

In	45	92	188	257	63	348
Out	**25**	**72**			**43**	

Rule:??

In	80	45	75	90	115	220
Out	**65**	**30**	**60**			

Rule: double

In	5	6	3	2	10	30
Out		**12**			**20**	

Student Resource 4

Name: _____

INPUT/OUTPUT TABLES-reteach

Create your own tables for a partner to solve.
Use the first one as an example to follow.

Add 13

In	8	15	22	29
Out				

Student Resource 5

Blank Function Tables- Extension

Name: _____

Now make up your own function tables using + or -

Rule:

In						
Out						

Rule:

In						
Out						

Rule:

In						
Out						

Rule:

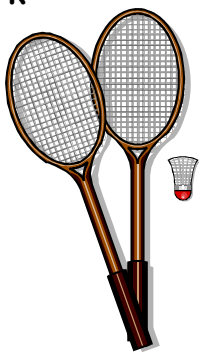
In						
Out						

Student Resource 6

It's All Unknown At This Point!

Directions: **Read the following word problems and write a number sentence for each one. Then solve them. Show your work.**

1. Gianna was getting ready to have a birthday party at the park and wanted to buy some games for her guests to play with. Her mother drove her to Sports Authority and gave her $40 cash. She bought a Funnel Ball set for $4, a soccer ball for $8, a badminton set for $6, and a net for $14.



Games	Cost
Funnel Ball	$4
Soccer Ball	$8
Badminton	$6
Net	$14

a. Write a number sentence for how much Gianna spent. (Hint: Include a variable in your number sentence.)

_____

b. How much money did Gianna spend at Sports Authority?

_____

Solve:

c. Write a number sentence to show how much change Gianna will get back?

_____

_____**solve:**

Student Resource 6

1.Gianna was only given $20. Which items could she have purchased? Write a number sentence as proof.

_____

_____

2. Chelsea went shopping for ingredients to make brownies. The brownie mix cost $3, the oil was $3, and the eggs had no price on them. The items went through the store register and the total she owed was $9.

a. Write the number sentence below to show the problem. (Hint: Include a variable in your number sentence.)

_____

b. How much did the eggs cost?

_____

Solve:

c. How much change did she get back from her $20 bill?

_____

Solve:

Student Resource 7a

Name_____ Date_____

They Just Don't Know!

Use the Table to answer the questions. Be sure to include an equation.

School	Number of Classes
Crofton Elm	43
Deale Elm	21
Central Elm	33
Pershing Hill Elm	18
Ridgeway Elm	26

1. Two schools are going to the Baltimore Aquarium on Friday. There are 59 classes in all. We know that Central Elm is one of the schools. What other school is going?

Equation: _____

Answer:_____

2. Next week three schools are going to Arlington Echo for a field trip. The camp director remembers that there are 82 classes coming, but he can't remember the names of all three schools. He knows that Deale and Crofton are two of the schools. Which one is he forgetting?

Equation: _____

Answer:_____

3. Use the table above to write your own word problem with a missing number. Trade with a partner. Be sure to write your solution on a separate sheet of paper.

Student Resource 7c

Name_____ Date_____

Use the Table to answer the questions. Be sure to include an equation.

Animals	Weight in pounds
Giraffe	573
Panda	276
Lion	200
Baby Elephant	954
Kangaroo	342

4. **The National Zoo is going to relocate some of their animals. The trucks can only carry so many pounds. The first truck can only hold 500 pounds. Which two animals can ride in that truck?**

Equation: _____

Answer:_____

5. **The second truck can carry 1,191 pounds. The zookeeper knows that the giraffe and the kangaroo are already on that truck. What other animal can ride with them?**

Equation: _____

Answer:_____

6. Use the table above to write your own word problem with a missing number. Trade with a partner. Be sure to write your solution on a separate sheet of paper.

Student Resource 8

Name_____ **Date**_____

BCR

Mrs. Kauffman bought soccer shoes and shin guards. The soccer shoes cost $11. She spent a total of $18 on the soccer gear. How much did the shin guards cost? Write an equation that solves the problem.

Step A:

_____

_____

Step B: Use what you know about equations and problem solving to explain why your answer is correct. Be sure to use words and/or numbers in your explanation.

Student Resource 9a

Name _____.....Date _____

Unit Assessment

1. Solve. 3 +5 + 6 = 6 +3 + X

_____

2. 7 + X = 13 X = _____

Write the equation that proves this using the inverse operation.

_____

3. Using the table below decide which number is missing and what rule is being used in the table.

In	10	5	8	20	7
Out	15	?	13	25	12

Rule: _____

Explain how you figured out the rule and the missing number.

_____

_____

_____

_____

4. Sally bought 10 pounds of birdseed. The birds ate 4 pounds in 1 week. How much was left? Write a number sentence to show how you would solve this. Use the letter X for the unknown.

_____

5. Maryann was very happy with the order that came from Oriental Trading. She paid for 7 basketballs and received 11. She ordered 5 footballs and received 9. She ordered 9 baseballs and received 13. She was wondering what happened to her order? How many soccer balls do you think she received when she only ordered 3?

Toys ordered				
Toys received				

Rule: _____

6. The goody machine in the airport was having difficulty understanding what people wanted. When they put in a number for a snack, the customers received something entirely different. Mike pressed number 10 and received number 4. Allison pressed number 13 and received number 7. Matt pressed number 17 and received number 11. What rule was the machine using that gave the people the wrong snack? What is going to happen when Marci presses number 20?

Snack number ordered				
Number of snack received				

Rule: _____

Appendix C: Additional Teacher Resources and Information

1. **<u>One Hundred Hungry Ants</u> by Elinor J. Pinczes. Boston: Houghton Mifflin, 1993. One hundred ants are marching to a picnic. They arrange themselves into rows of different sizes in order to get to the picnic faster.**

- **Have children complete the following chart.**

Number of Columns	Number of Ants in a Column
1	100
2	

- **Write a rule that describes the pattern in the table. Graph the results.**

2. **First in Math Website for 24 Challenge Game. Free 30-day trial if you visit www.firstinmath.com**
   User ID: Love
   Password: Math
3. **Ideas were inspired by the following:**
   - **<u>Groundworks- Algebraic Thinking Grade 3</u> Creative Publications**
   - **<u>Beginning Algebra Thinking For Grades 3-4</u> Frank Schaffer Publications**
   - **<u>Hands-on Equations</u> by Dr. Henry Borenson**

     www.borenson.com

     -Sample videos, lesson ideas, and how to order materials
   - **Math in literature website http://fcit.usf.edu/math/resource/bib.html**
   - **<u>Navigating through Algebra in Grades 3-5</u> NCTM**